on the Isthmus of Panama was only one half-inch, and the elevation of the railroad less than one-twentieth of an inch. Again: the mountain of Santa Marta, near Cartagena, was 17,000 feet, or nearly three inches in height; but the whole gave relative heights which could have been shown in no other way.

J. R. BARTLETT.

U. S. hydrographic office, Jan. 15.

THE BALLOON IN METEOROLOGY.

ON the afternoon of Jan. 19 the first balloon ascent ever made in this country solely in the interest of meteorology took place at Philadelphia. As the beginning of a series to be carried out strictly for scientific purposes, it was an event of no small importance. Gen. Hazen, chief signal-officer, U.S.A., recognizing the importance and value of a more complete knowledge of the upper atmosphere, entered into a contract some time ago with the well-known aeronaut, Mr. S. A. King, for a number of 'trips to the clouds,' an ascent to be made at any time on eight hours' notice.

Although the first balloon excursion for strictly scientific purposes made in America, this was by no means the first on record. Naturally, very soon after the invention of the balloon, attempts were made to utilize it in meteorological investigations. Doubtless, the first ascents having this end in view were made by Mr. Robinson, from St. Petersburg, at the command of the emperor of Russia, in 1803 and 1804; but it does not appear that any important results came from them. On Aug. 31, 1804, Gay-Lussac and Biot made an ascent, reaching a height of thirteen thousand feet; and meteorological observations were commenced after an elevation of seven thousand feet had been passed. On Sept. 15 of the same year, Gay-Lussac reached a height of twenty-three thousand feet, making a series of most important observations, and bringing air down from that height, which, on being analyzed, was found to have the same constitution as that at the surface.

Not much seems to have been done from that time until 1843, when the British association for the advancement of science appointed a committee and voted a sum of money for the purpose of experimenting with captive balloons. Although the work was continued under several committees, it was not very successful, owing, doubtless, to a lack of skill in the management of captive balloons. In 1850 Messrs. Bixio and Barral made ascents in France for the purpose of meteorological study, in which it was planned to ascend to heights as great as forty thousand feet. They did not succeed, however, in reaching greater elevations than had been attained before, but obtained results verifying in the main those of Gay-Lussac. On one of these excursions an elevation of twenty-three thousand feet was reached; and, in addition to the meteorological work, interesting observations were made on polarization and other optical phenomena.

A series of very important ascents was made by Mr. Welsh of the Kew observatory in August, October, and November of 1852, in which heights varying from twelve thousand feet to twenty-three thousand feet were reached.

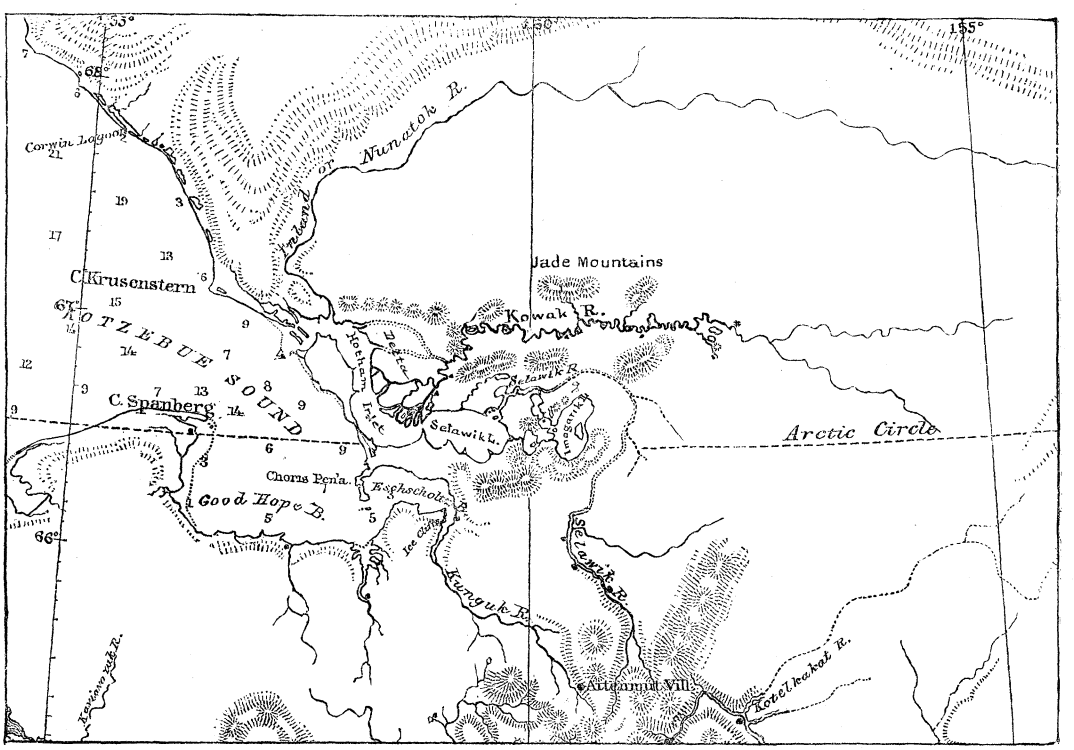
A few years later the interest of the British association in the subject was renewed, and culminated in the celebrated series of ascents made by Mr. Glaisher, the first being on July 17, 1862. In these ascents the most complete arrangements were made for the study of the physics of the higher atmosphere, and they were remarkably successful.

Since that time, scientific ballooning has been carried on with great success in France by Camille Flammarion, W. De Fonville, and Gaston Tissandier. A complete and extremely interesting history of their work (up to the date of its issue), together with that of Glaisher, is to be found in a volume entitled 'Travels in the air,' by James Glaisher.

The U. S. signal-service has had this subject under consideration for several years. Professor Abbe began in 1871 to collect meteorological records made in balloons. In 1872 the records of fifty ascents had been tabulated, studied, and valuable results obtained. In 1876 one thousand small balloons were sent with the Polaris expedition, to be used in determining the height of the clouds; but, owing to an unfortunate accident, they could not be utilized. At various times the chief signal-officer has sent observers on balloon excursions which were made for purposes other than scientific.

The considerable certainty with which the movement of a storm can now be predicted renders it possible and desirable to make systematic use of the balloon in the study of unusual atmospheric conditions, and the series of ascents just begun is planned with that end in view. Among other things, it is desired to determine the difference in the temperature gradient in well-defined 'high' and well-defined 'low' pressures. For this purpose it is necessary to foretell the arrival of a particular atmospheric condition at Philadelphia, from

which place the ascents will be made. This can readily be done so as to give the aeronaut eight hours' notice for the preparation of his balloon, and the observers who accompany him sufficient time to reach Philadelphia from Washington. The first ascent was expected to be rather experimental and suggestive in its character. It was the intention to start at seven A.M., on the 19th; and a telegram to that effect was sent to Mr. King, who responded that he would be ready. But, owing to the extreme hour of starting, the observations made were not so numerous as could be desired, although seven complete sets were obtained before darkness rendered further reading impossible. A safe and quiet landing was effected at about half-past seven P.M., near the village of Manahawken, on the New-Jersey coast. The greatest height reached was somewhat over one mile. This trial-trip has suggested some modifications in the plans, which will render future ascents more successful. The danger incident to a



THE NEW SURVEYS OF THE KOWAK RIVER, ALASKA.

cold, it was found that the balloon could not be handled for filling without danger of cracking; and waiting for the sun to warm it up caused so much delay, that the start was not made until quarter-past four P.M. The balloon was the Eagle Eyrie, holding twenty-five thousand cubic feet when filled, and having a lifting-power of about a thousand pounds. The occupants of the car were Mr. King and Private Hammond, a skilful observer detailed from the office of the chief signal-officer for the purpose. Mr. Hammond carried with him a complete outfit for making barometric, thermometric, and hygrometric observations. Owing to the late balloon ascent is greatly over-estimated by many. In the company of an experienced and skilful aeronaut the risk to life and limb is hardly greater than on a railway-train or a steamboat. Mr. Green, the famous English aeronaut, made fourteen hundred ascents, and lived to be eighty-six years old. The excursion of the 19th was the two hundred and fifty-eighth made by Mr. King. Volunteers for this service are by no means wanting among those connected with the signal-service; and Professor Abbé is so desirous of knowing what is going on 'inside of a storm,' that he means to make an ascent himself, in order to find out.

Altogether, this systematic use of the balloon for the study of special meteorological conditions must be regarded as a new departure; and the signal-service is to be congratulated on its successful initiation.

THE KOWAK RIVER.

THE map opposite shows the explorations made by the U. S. revenue marine on the Kowak or Kūak River during the season of 1884. The asterisk indicates the farthest explored point on the river. The native settlements are shown by small black triangles. The course of the lower part of the Selawik River and part of the Kowak delta, indicated in dotted lines, have not been explored. It will be observed that the new explorations almost exactly join the course of the river as laid down on the coast-survey map of 1884 by Dall, from Woolfe and Jacobsen's sketch-map. The spelling of the names on the above map has not been modified to agree with the Innuit pronunciation as obtained by Lieut. Cantwell, since the different tribes of the region do not pronounce these names uniformly, and the names 'Kowak' and 'Selawik' have been adopted on all charts for many years. According to Lieut. Cantwell, the people of the river call it Kū-ak (or 'big river'). Other names are Shēlāwik (Selawik, or 'fish') lake and river, Imogarik'-choit (lake or 'little sea'). The stream connecting this with Selawik River is Ig'-yăk ('throat') River: that flowing to Selawik Lake is Ki-ăk'-tŭk ('fox') River. Others have been referred to in our report of this exploration. It is probable that the upper part of the Selawik, taken from the Western union explorations of 1866–67, is too far to the westward, and that the course of the river is less irregular than above indicated; but there are not sufficient data to make this certain, or to alter the chart at present.

A GLANCE AT THE HISTORY OF OUR KNOWLEDGE OF FOSSIL PLANTS.[1]

THE ancients, though acquainted with fossil shells and corals, were wholly ignorant of fossil plants; and the first mention of any vegetable substance in a state of petrifaction was made by Albertus Magnus about the middle of the thirteenth century. Agricola, Gesner, and others treated of petrified wood in the sixteenth century; and, during the seventeenth, Major in Germany, and notably Lhwyd in England, called attention to the existence of vegetable impressions in the rocks. By the beginning of the eighteenth century considerable collections of such material existed in the European museums, and this had become the subject of animated discussion. Dendrite had long been known, and was then generally supposed to represent vegetable matter; but in the year 1700 Scheuchzer overthrew that doctrine, and established its purely mineral character.

Prior to this date the prevailing notions of the times ascribed all fossils to some mysterious cause, and denied their reality as the remains of things that had once possessed life. As to their true nature, there was, however, no harmony of opinion. Some looked upon them as divinely created archetypes of living things, others as divine enigmas placed before man to test his faith, others still as merely the varied forms of the subterranean world corresponding to those of the earth's surface, while many regarded such objects as purely accidental, or as mere freaks of nature.

Against these predominant mystic views there had, however, long existed the theory that these forms, so strikingly similar to real things, might be the petrified remains of the life that perished by the Noachian deluge, and which had been stranded on the mountains and highlands of Europe and Asia. This view was countenanced by Martin Luther, and strongly defended by Alexander ab Alexandro in the sixteenth century; while towards the close of the seventeenth it secured many earnest advocates, including Woodward of England, and Scheuchzer of Switzerland. The latter undertook to defend his theory from the evidence furnished by plant-remains; and from this zeal resulted his greatest work, one of the most remarkable of the time, — his 'Herbarium diluvianum.' This appeared in 1709, and in it are enumerated and figured many fossil plants. These impressions were declared to be those of existing and often familiar species; and we find among them the myrrh of Scripture, Galium, Hippuris, and other well-known forms. So confident was Scheuchzer that these were living plants, that in 1718 he ventured to classify all known impressions according to Tournefort's system, as drawn up in his 'Elémens de botanique' in 1694. The new edition of the 'Herbarium diluvianum,' which appeared in 1723, contained this systematic table, in which four hundred and forty-five species are enumerated.

This bold stroke aroused an intense interest in the subject, and immediately led to a closer comparison of the fossil with the living flora. In this work, Leibnitz in 1706, and Antoine de Jussieu in 1718, had already led the way by examining certain well-defined impressions, and expressing strong doubts of their identity with any European species. Further investigations were made; and these disagreements soon gave rise to the belief that they were tropical forms which by some convulsion or vicissitude had been brought to Europe, and buried under its soil. This view prevailed until the close of the eighteenth century.

Thus far the idea of ancient or extinct life had

[1] Read before the American association for the advancement of science, Sept. 8, 1884, by LESTER F. WARD.